WHAT IS CLAIMED IS:

1. A method for planning a stereotactic surgical procedure using a fluoroscope for generating images of the body, the method comprising the steps of:

placing adjacent to the body a registration artifact including a plurality of fiducials at known positions relative to a known coordinate frame of the artifact;

displaying on a computer monitor an image taken of the patient's body and the registration artifact;

receiving an input to identify two-dimensional coordinates of the fiducials of the registration artifact displayed on the image; and

registering the image by creating a geometric model having parameters, said model projecting three-dimensional coordinates into image points, and numerically optimizing the parameters of the geometric model such that the projections of the known three-dimensional coordinates of the fiducials best fit the identified two-dimensional coordinates in the image.

2. The method of claim 1, further comprising the steps of:

displaying a second image taken of the patient's body and the registration artifact but from an angle different from that of the first image;

receiving an input to identify two-dimensional coordinates of the fiducials of the registration artifact displayed on the second image; and

registering the second image by creating a geometric model having parameters, said model projecting three-dimensional coordinates into image points, and numerically optimizing the parameters of the geometric model such that the projections of the known

three-dimensional coordinates of the fiducials best fit the identified two-dimensional coordinates in the second image.

3. The method of claim 2, further comprising the step of receiving a user input to select a point upon the first image, said point partially designating a virtual guidewire.

4. The method of claim 3, further comprising the step of receiving an input specifying a position, a length, and angles of the virtual guidewire.

5. The method of claim 4, further comprising the step of drawing projected guidewire segments on the images, such that the projected guidewires are projections of the virtual guidewire onto the images.

6. The method of claim 5, further comprising the steps of receiving a user input to move either end of the projected guidewire on either image, by revising the virtual guidewire of which the two projected guidewires are projections, and by redrawing the two projected guidewires on their respective images in correspondance with the revised virtual guidewire.

7. The method of claim 5, further comprising the steps of receiving a user input to change the length of the virtual guidewire, and redrawing the two projected guidewires on their respective images in correspondance with the revised virtual guidewire.

8. The method of claim 5, further comprising the steps of receiving a user input to change the sagittal angle of the virtual guidewire, updating the orientation of the virtual guidewire based on the new sagittal angle, and redrawing the two projected guidewires on their respective images in correspondance with the revised virtual guidewire.

9. The method of claim 5, further comprising the steps of receiving a user input to adjust the transverse angle of the virtual guidewire, updating the

orientation of the virtual guidewire based on the new transverse angle, and redrawing the two projected guidewires on their respective images in correspondance with the revised virtual guidewire.

10. The method of claim 5, further comprising the steps of receiving a user input to adjust the coronal angle of the virtual guidewire, updating the orientation of the virtual guidewire based on the new coronal angle, and redrawing the two projected guidewires on their respective images in correspondance with the revised virtual guidewire.

11. The method of claim 5, further comprising the step of producing an output to adjust the coordinates of a tool guide such that its axis is brought into alignment with the virtual guidewire.

12. The method of claim 11, further comprising the step of producing an output to adjust the coordinates of a tool guide such that the position of the guide along its axis is offset by a preselected distance from one endpoint of the virtual guidewire.

13. The method of claim 11, further comprising the step of transmitting said coordinates to an automatic mechanical device.

14. The method of claim 11, further comprising the step of displaying said coordinates with which a human operator may manually adjust a mechanical device.

15. The method of claim 11, wherein the registration artifact includes a tool guide.

16. The method of claim 2, further comprising the step of receiving an input to select a point upon the first image, said point partially designating a virtual targetpoint for a surgical instrument.

17. The method of claim 16, further comprising the step of drawing a projected targetpoint both on the first image and another on the second image, such that the

projected targetpoints are projections of a virtual targetpoint onto the images.

18. The method of claim 17, further comprising the steps of receiving a user input to move the projected targetpoint on either image, by revising the virtual targetpoint of which the two projected targetpoints are projections, and by redrawing the two projected targetpoints on their respective images in correspondance with the revised virtual targetpoint.

19. The method of claim 18, further comprising the step of producing an output to adjust the coordinates of a tool guide such that its axis intersects the virtual targetpoint.

20. The method of claim 19, further comprising the step of producing an output to adjust the coordinates of a tool guide such that the position of the guide along its axis is offset by a preselected distance from the virtual targetpoint.

21. The method of claim 19, further comprising the step of transmitting said coordinates to an automatic mechanical device.

22. The method of claim 19, further comprising the step of displaying said coordinates with which a human operator may manually adjust a mechanical device.

23. The method of claim 19, wherein the registration artifact includes a tool guide.

24. The method of claim 1, further comprising the step of receiving an input to select a point upon the first image, said point partially designating a virtual guidewire representing a trajectory for the surgical instrument into the body.

25. The method of claim 24, further comprising the step of producing an output to adjust the coordinates of a tool guide such that its axis is brought into alignment with the virtual guidewire.

26. The method of claim 25, further comprising the step of transmitting said coordinates to an automatic mechanical device.

27. The method of claim 25, further comprising the step of displaying said coordinates with which a human operator may manually adjust a mechanical device.

28. The method of claim 25, wherein the registration artifact includes a tool guide.

29. An apparatus for planning a stereotactic surgical procedure using a fluoroscope for generating images of the body, the apparatus comprising:

means for placing adjacent to the body a registration artifact including a plurality of fiducials;

means for displaying an image taken of the body and the fiducials;

means for identifying two-dimensional coordinates of the fiducials in an image;

means for registering an image with respect to said fiducial artifact;

means for receiving inputs to select and adjust a virtual guidewire or targetpoint, while the projections of said guidewire or targetpoint are displayed superimposed upon the image; and

means for producing an output to adjust the coordinates of a tool guide.

30. An apparatus for planning a stereotactic surgical procedure for a linear trajectory insertion of a surgical instrument into a body using a fluoroscope for generating images of the body, the apparatus comprising:

a registration artifact located adjacent to the body, the registration artifact including a plurality of fiducials located at known three-dimensional coordinates relative a known coordinate frame;

means for displaying at least one image taken of the body and the fiducials on at least one computer monitor;

means for identifying two-dimensional coordinates of the fiducials in each image; and

means for numerically optimizing parameters of a geometric model, said model projecting three-dimensional coordinates into image points, such that the projections of the known three-dimensional coordinates of the fiducials best fit the identified two-dimensional coordinates in the image.

31. The apparatus of claim 30, further comprising a means for receiving user input to select a position, a length, and the angles of a virtual guidewire; and means for displaying a projected guidewire segment on each registered image representing the location of the virtual guidewire.

32. The apparatus of claim 30, further comprising a tool guide, and means for producing an output to adjust the coordinates of the tool guide.

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